

HATCHERY EVALUATION REPORT
LYONS FERRY HATCHERY - SPRING CHINOOK

**An Independent Audit Based on Integrated Hatchery Operations Team
(IHOT) Performance Measures**

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CONTENTS

Section 1 Executive Summary	1-1
Section 2 Facility Description	2-1
Section 3 Compliance Status	3-1
Section 4 Remedial Actions	4-1
Section 5 Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries	5-1
Section 6 Annual Operating Expenditures	6-1

List of Tables

Table

1	Compliance with Performance Measures - Lyons Ferry Hatchery (Spring Chinook)
2	Remedial Actions Required- Lyons Ferry Hatchery (Spring Chinook)
3	Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries- Lyons Ferry Hatchery (Spring Chinook)
4	Annual Operating Expenditures - Lyons Ferry Hatchery (Spring Chinook)

Executive Summary

This report presents the findings of the independent audit of the Lyons Ferry Hatchery (Spring Chinook). Lyons Ferry Hatchery is located downstream of the confluence of the Palouse and Snake rivers, about 7 miles west of Starbuck, Washington. The hatchery is used for adult collection of fall chinook and summer steelhead, egg incubation of fall chinook, spring chinook, steelhead, and rainbow trout and rearing of fall chinook, spring chinook, summer steelhead, and rainbow trout.

The audit was conducted in April 1996 as part of a two-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) Strategy for Salmon and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating

fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 98-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters sources
- The hatchery manager was asked to fill out and return the audit form
- A 1-2 day site audit inspection visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.

- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Lyons Ferry Hatchery (Spring Chinook) Audit Results

The Lyons Ferry facility includes 4 raceways for adult holding, 47 raceways and 3 earthen ponds for rearing, incubation facilities, and 4 satellite facilities. Lyons Ferry Hatchery was constructed under the Lower Snake River Compensation Program as partial mitigation for federal dams constructed on the lower Snake River. The hatchery started operation in 1984.

The hatchery was in general compliance with most of the performance measures. In the facilities requirements area, the audit found that the hatchery needed a chiller for incubation, double screening for 14 raceways, and new adult collection weir location. The audit found that the hatchery did not have information on some of the water chemistry and contaminant parameters. The hatchery exceeds density criteria for rearing during some months. In the area of genetics policy, the hatchery did not have a written broodstock collection plan or a Genetics Monitoring and Evaluation Program in place.

The specific areas in which the Lyons Ferry (Spring Chinook Program) requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in order of occurrence on the questionnaire without intent of ranking or otherwise assigning priority:

- Chiller for incubation
- Monitor total gas pressure and dissolved oxygen

- Monitor water chemistry parameters on routine basis
- Monitor water contaminants on routine basis
- Develop goal for green-eye to eyed-egg and eyed-egg to fry survival for IHOT
- Need double screen for 14 raceways on salmon side of hatchery
- Regional quality control officer to oversee production procedures and monitor feed quality
- Density greater than criteria; need to consider reducing density or changing procedures
- Need to measure smoltification
- Uncertain if release strategy is appropriate for the program
- Conflict between WDFW and IHOT disinfection policies
- Reduction of DO to 8 ppm after transport system is functioning properly
- Develop broodstock collection plan for IHOT Operations Plan
- Develop genetics monitoring and evaluation plan for IHOT Operations Plan
- Relocate adult collection weir lower on river to collect representative sample of adults

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 2, Section 4) were not listed above.

Facility Description

Name: Lyons Ferry Hatchery

Stock/Species: Fall Chinook, Spring Chinook, and Summer Steelhead

Operating Agency: Washington Department of Fish and Wildlife

Funding Agency: U.S. Fish & Wildlife Service

Location: Lyons Ferry Hatchery is located downstream of the confluence of the Palouse and Snake rivers, about 7 miles west of Starbuck, Washington at an elevation of 526 feet above sea level.

Address: Lyons Ferry Hatchery
Washington Department of Fish and Wildlife
Box 278
Starbuck, WA 99359

Complex Manager: Mr. Butch Harty

Phone (509) 646-3454

Fax: (509) 646-3400

Purpose: Lyons Ferry Hatchery was constructed under the Lower Snake River Compensation Program as partial mitigation for federal dams constructed on the lower Snake River. The hatchery started operation in 1984.

The purpose of the Spring Chinook Program is assist in the recovery of the Tucannon Spring Chinook while maintaining the genetic integrity of the wild spring chinook. These activities are done in conformance

Production Goal:

with the ESA Salmon Recovery Plan and tribal agreements

Fall Chinook

800,000 smolts (8/lb) for on-station release

Spring Chinook

132,000 fingerling (35/lb) for transfer to Tucannon Hatchery for
final rearing and acclimation

Summer Steelhead

931,200 smolts (4-8/lb) for on-station and for release from
satellite facilities

Rainbow Trout

353,000 legal sized fish and 200,00 sub-legal fish (108,000 lb)

Water Supply:

Total Production: 423,800 lb (average of 1993-5)
Water is supplied to the hatchery from wells. No river water is
currently being used.

Facilities:

Incubation:

112 16-stack vertical tray

88 shallow troughs

4 deep tanks

Adult Holding

4 raceways, 11,800 cf each

Raceways

28 raceways, 3,000 cf each

	19 raceways, 3220 cf each
Rearing Ponds	3 earthen ponds, 675,000 cf each (these ponds are commonly called the ÒlakesÓ)
Satellite Facilities	<p>Tucannon Hatchery (Spring Chinook, trout, and Steelhead programs)</p> <p>Curl Lake Rearing Pond (Steelhead program)</p> <p>Cottonwood Rearing Pond (Steelhead program)</p> <p>Dayton Rearing Pond (Steelhead program)</p>

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).

The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audited included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 98 page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Section 7 includes general information needed for the audit:

Section 1 Performance Measures for Program Objectives (PMs 1-4)

Section 2 Performance Measures for Facility Requirements (PMs 5-15)

Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

Section 3	Performance Measures for Hatchery Practices (PMs 16-25)
Section 4	Performance Measures for Fish Health Policy (PMs 26-34)
Section 5	Performance Measures for Ecological Interactions (PMs 35-38)
Section 6	Performance Measures for Genetics Policy (PMs 39-43)
Section 7	Performance Measures for General Information (PMs General 1-2)

Several performance measures are repeated in various sections of the audit. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by light gray shading.

The Hatchery Audit Process

The hatchery audit will be conducted over a two-year period that concludes in 1997. This report covers phase one of the audit, which consists of an audit of four hatcheries and seven species or stocks of fish. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and on-site visits. The site visits were conducted from March 4 to March 8.

The following is the five step audit process:

1. Information was obtained from headquarters sources.
2. The hatchery manager was asked to fill out and return the **Audit Form**.

3. A 1-2 day site audit inspection visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. A **Compliance Report** was developed to document the compliance status of each performance measure. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative.
5. This information was used to develop a draft **Hatchery Evaluation Report**. Based on review and comments of this prototype document, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Lyons Ferry Hatchery (Spring Chinook)

This section documents the compliance status of the Lyons Ferry Hatchery (Spring Chinook). Each performance measure is presented in a table taken from the audit form (Table 1). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4, where the cost of the required remedial actions is also presented.

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#1	Are the hatchery programs outlined in a subbasin management plan?		4			Lower Snake River Compensation Plan; ESA	
#2	Is the hatchery operating under a current hatchery operational plan?		4			Review of IHOT Operation Plan	
	Is it understood by staff?		4			Discussion	
	Is it being followed?		4			Discussion	
#3	Is a hatchery monitoring and evaluation plan in place?		4			5 Year Plan & Annual Reports	
#4	Specific performance measures include:						

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#4a	Adult contribution to fisheries, spawning grounds and hatchery		4			Review of records/Discussion	
#4b	Adult pre-spawning survival as compared with established goal				4	4 out of 5 in compliance	None; adult fish are no longer held at Tucannon Hatchery
#4c	Egg-take as compared with established hatchery goal				4	3 out of 5 years in compliance	None; rebuilding run
#4d	Green-egg-to-eyed-egg survival as compared with established goal	4				No goal listed in Operational Plan	Develop goal for IHOT
#4e	Eyed-egg to fry survival as compared with established goal	4				No goal listed in Operational Plan	Develop goal for IHOT
#4f	Fry-to-smolt survival as compared with established goal		4			Review of records/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#4g	Production as compared with established goal				4	4 out of 5 years in compliance	Need better returns
#4h	Percent survival (smolt to adult) as compared with established goal				4	0 out of 3 years in compliance	Need better returns
#4i	Number of eggs, fry, fingerlings, smolts and/or adults to meet basinwide needs	4					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#5	Water quality						
#5a	Temperature Do your water temperatures meet the criteria for spawning? Do your water temperatures meet the criteria for incubation? Do your water temperatures meet the criteria for rearing?		4 4 4			Review of records/Discussion Ò Ò	Need chiller to cotrol development (150 gpm @ ÆT=-10jF)

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#5b	Dissolved gases						
	Is the oxygen level near saturation?			4		No data provided	Monitor total gas pressure (TGP) and dissolved oxygen (DO)
	Is the dissolved nitrogen level less than saturation?			4		No data provided	
#5c	Chemistry						
	Ammonia (un-ionized)			4		No data	Run analysis
	Carbon Dioxide			4		No data	Run analysis
	Chlorine			4		No data	Run analysis
	pH			4		No data	Run analysis
	Copper				4	Limited data	Run analysis to confirm
	Hydrogen Sulfide			4		No data	Run analysis
	Iron				4	Limited data	Run analysis to confirm
	Zinc		4				

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#5d	Turbidity						
	Does your turbidity meet the criteria?		4			Groundwater supply; not a problem	
#5e	Alkalinity and hardness						
	Does your alkalinity and hardness meet the criteria?		4			Review of records	
#5f	Nitrite						
	Does your nitrite meet the criteria?		4			Review of records	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#5g	Contaminants						
	Aldrin			4	No data		Run analysis
	Endrin			4	No data		Run analysis
	Dieldrin			4	No data		Run analysis
	Heptachlor			4	No data		Run analysis
	Chlordane			4	No data		Run analysis
	Methoxychlor			4	No data		Run analysis
	Lindane			4	No data		Run analysis
	Malathion			4	No data		Run analysis
	Guthion			4	No data		Run analysis

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#5h	Pathogens						
	What portions of the hatchery have disease-free water?						
	Adult holding?		4				
	Incubation?		4				
	Early rearing?		4				
	Rearing?		4				
	Acclimation Ponds?				4	Use surface water supply	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#6	Alarm Systems (Hatchery Only)						
	Do the following areas have alarms?						
	Intake?		4			Inspection/Discussion	
	Large rearing ponds and adult holding ponds?		4			Ò	Ò
	Raceway headboxes and rearing ponds?		4				
	Incubation facilities?	4					
	Quarantine areas and facilities?	4					
	Water treatment systems?		4			Discussion	
	Security?		4			Ò	Ò
	Are there outside systems and buzzers in on-site residences?						
	Are water flow alarms checked daily?		4			Some checked daily	Need more frequent checking
	Are all other alarms checked weekly?		4			Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#7	Adult collection and holding facilities						
	Do you meet the adult holding criteria?		4			Review of records/Discussion	
#8	Incubation facilities						
	Type 1: Vertical Tray		4			Inspection of facilities/Discussion	
	Do you have an adequate number of units for the overall program?						

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#9	Rearing facilities						
	Type 1: Raceways		4			Inspection of facilities/Discussion	
	Do you have an adequate number of units for the overall program?						
	Type 2: Lakes		4			Inspection of facilities/Discussion	
	Do you have an adequate number of units for the overall program?						

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#10	Screening facilities Do you meet the approach velocity criteria: Are the fish screens regularly cleaned? Are rearing containers double screened for fish that should not be released to adjacent water?	4 4			4	Groundwater supply; not applicable Groundwater supply; not applicable	Need double screens for 14 raceways on salmon side
#11	Predator control facilities Are your predation control facilities effective?		4			Inspection of facilities/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#12	Food storage facilities and quality control					
	Does the storage of dry/semi-moist/moist foods follow food manufacturer's recommendations? (dry<12%; semi-moist 12-20%; moist >20% moisture)					
	Does a regional quality control officer oversee production procedures and monitor:					
	Verification by feed manufacturer that ingredients meet specifications?					
	Ensure feeds do not contain unwanted drugs or other additives?					
	Analyze ingredients contained in the final food product to ensure that feed					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
			4			Discussion	
					4	Discussion	This should be addressed at state or regional level; not hatchery responsibility
					4	Discussion	
					4	Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#13	Release facilities Do the release facilities ensure that fish are not subjected to adverse conditions?		4			Inspection of facilities/Discussion; it was not possible to visit the up-river acclimation sites due to flood damage	
#14	Pollution abatement facilities Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)? Are pollution abatement facilities operated correctly?		4 4			Inspection of facilities/Discussion Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#15	Transportation facilities						
	Are the transport systems adequate to meet IHOT performance measures for transportation practices?		4			Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#16	Broodstock selection practices						
	Is the donor selection process document attached?	4				Existing Program; does not apply	
	Was the donor selection outline followed in selecting the hatchery broodstock?	4				Existing Program; does not apply	
	Go to PM #40 in Genetics						
#17	Spawning practices						
	Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?		4			Review of records/Discussion	
	Go to PM #42 in Genetics Section						

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#18	Incubation practices						
	Are specific incubation standards listed in the hatchery operations plan?		4			In hatchery Operational Plan	Include in IHOT Operational Plan
	Are incubation practices written?		4			In hatchery Operational Plan	
	Incubation Type 1: Vertical Tray See PM #8)					Review of records/Discussion	
	Do you meet the loading and flow criteria?						

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#19	Rearing practices						
	Are specific rearing standards listed in the hatchery operations plan?		4			In hatchery Operational Plan	Include in IHOT Operational Plan
	Are rearing practices written?		4			In hatchery Operational Plan	
	Rearing Unit Type 1: Raceways (see PM 9)						
	Do you meet the density and DI criteria?						
	Do you meet the Loading and FI criteria?		4		4	DI criteria = 0.18; two months slightly above (0.20 and 0.21)	Very close to criteria
#20	Smolt quality						
	Do you produce a high quality smolt?		4			Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#21	Fish health management practices					
	Are the monthly hatchery monitoring visits being conducted? (PM #26)					
	Are the annual broodstock inspections being conducted? (PM #27					
	Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)					
	Are the following water quality parameters within criteria? (PM #5a-5h)					
	Water temperature					
	Dissolved gases					
	Chemistry					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
			4			Review of records/Discussion
			4			Review of records/Discussion
			4			Review of records/Discussion
			4			Review of records
				4		Review of records
			4	4	4	No data for many parameters
						Review of records

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
						<p>Monitor TGP/DO</p> <p>Run analysis</p>

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#22a	Does hatchery performance meet requirements outlined in the regional hatchery policies and in subbasin and hatchery plans for the following areas:						
#22a1	Percent smoltification						
	Do you measure percent smoltification?				4	Discussion	Need to monitor smoltification
	Did you meet the smoltification criteria?	4				No goal found	
#22a2	Rearing density (prior to release)						
	Did you meet the rearing density criteria just prior to release?		4			Review of record/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#22a3	Disease condition (at release) Did you meet all disease regulations just prior to release?		4			Review of records/Discussion	
#22a4	Number (at release) Did you meet the release number goal?		4			Review of records	
#22a5	Size at release Did you meet the size goal?				4	In compliance 0 out of last 2 years	Need chiller for incubation
#22a6	Dates of release Did you meet the release date goal?		4			Review of records/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#22a7	Location of release Did you the release the fish at the specified location?		4			Review of records/Discussion	
#22b	Are fish reared in the subbasin or acclimated in the subbasin? Are the fish reared in the subbasin? Are the fish acclimated in the subbasin?		4 4			Discussion Discussion	
#22c	Is the release strategy appropriate for the program?			4		Uncertain, survival isn't good	Strategy is changing yearly

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No
#23	<p>Transportation facilities</p> <p>Do transportation equipment and personnel receive disinfection before and after use?</p> <p>Disinfection of fish tank interior using a solution of 200 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?</p> <p>Disinfection of fish transport vehicle exterior using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?</p> <p>Disinfection of fish transport vehicle (cab) using 600 ppm quaternary ammonia</p>				

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
			4			Discussion	
					4	Department policy is 10 minutes	Change department policy or IHOT policy
			4			No every time	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#23	Transportation facilities					
(cont)	Does a pre-loading inspection covering the following: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading the fish in the transport unit?		4			Discussion
	Do hauling criteria include checking the fish 45 minutes to 1 hour after loading occur?		4			Discussion
	When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained approximately 8 ppm?			4		Uncertain
	Is water temperature in the transportation unit maintained within 42-48°F range?		4		4	Fish are hauled in 51-53°F water, which is the temperature of the

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

[illegible]

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#24	<p>Evaluation practices</p> <p>Has the hatchery conducted fishery contribution studies to:</p> <p>Determine the requirements for evaluating and improving management programs?</p> <p>Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?</p> <p>Develop guidelines that define if the proper stocks of fish are currently being used?</p>		<p>4</p> <p>4</p> <p>4</p> <p>4</p>			<p>Discuss with hatchery staff & evaluation biologists</p> <p>Ò</p> <p>Ò</p>	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#25	Training practices					
	Does the hatchery have a training schedule for its staff?					
	Does each staff member have a personal training plan approved by a supervisor and reviewed annually?					
	Does the hatchery routinely exchange training details between other hatcheries and agencies?					
	Does the hatchery encourage and reward off-duty training of staff?					
	Does the hatchery conduct monthly staff meetings?					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
			4			Discussion	
			4			Discussion	
			4			Discussion	
			4			Discussion	
			4			Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#26	Are monthly hatchery monitoring visits being conducted by a qualified fish health specialist?		4			Review of records/Discussion	
#27	Are all of the functions of the hatchery yearly monitoring visits being completed as described below?		4			Review of records/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#28	Is the hatchery following accepted sanitation procedures?						
	Are there any sources of pathogen-free water, especially for incubation and early rearing?		4			Groundwater supply	
	Are the hatchery sanitation procedures understood and being followed?		4			Inspection of facilities/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#29	<p>Are water quality parameters being followed?</p> <p>Are the following water quality parameters within criteria? (PM #5a-5h)</p> <p>Water temperature</p> <p>Dissolved gases</p> <p>Chemistry</p> <p>Turbidity</p> <p>Alkalinity and hardness</p> <p>Nitrite</p> <p>Contaminants</p> <p>Go to PM #21</p>						
			4	4	4	<p>Review records</p> <p>No data</p> <p>No data for many parameters</p> <p>Review records</p> <p>Review records</p> <p>Review records</p> <p>No data</p>	<p>MonitorTGP and DO</p> <p>Run analysis</p> <p>Run analysis</p>

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#30	<p>Are incubation and rearing standards being followed?</p> <p>Are the incubation practices being following the IHOT incubation criteria? (PM #18)</p> <p>Are the rearing practices following the IHOT criteria? (see PM #19)</p> <p>Go to Rearing practices, PM #18-PM #19</p>		4		4	<p>Review of records/Discussion</p> <p>Review of records/Discussion</p>	Very close to criteria
#31	Are egg and fish transfer/release requirements met?		4			Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#32	Is the hatchery's program outlined in a subbasin management plan? Go to subbasin plan, PM # 1		4			Lower Snake River Compensation Plan & ESA	
#33	Is the hatchery operating under a current hatchery operational plan? Go to operational plan, PM # 2		4			Review of IHOT Hatchery Operation Plan/Discussion	
#34	Is a hatchery monitoring and evaluation plan in place? Go to hatchery monitoring and evaluation plan PM # 3		4			Review of Monitoring and Evaluation Plan/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#35	<p>Does the hatchery program meet requirements established in the regional hatchery policies and subbasin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, and spawning and egg-take protocols.</p>						
	Does the hatchery program meet the requirements for the following: (PM #1-PM #2)		4			Review of records/Discussion	
	Species protocols? (PM #4a)		4			Review of records/Discussion	
	Stock protocols? (PM #4a)		4			Review of records/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#36	<p>Does the hatchery’s performance meet requirements outlined in the regional hatchery policies and in subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location at release.</p>						
	Percent smoltification (PM #22a1)	4				No goal found	
	Rearing density (PM #22a2)		4			Review of records/Discussion	
	Disease condition (PM #22a3)		4			Review of records/Discussion	
	Number at release (PM #22a4)		4			Review of records/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#37	Are fish reared in the subbasin or acclimated in the subbasin? See PM #22b		4			Review of records/Discussion	
#38	Is the release strategy appropriate for the program? See PM #22c			4		Uncertain, survival isn't good	Strategy is changing yearly

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status	Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
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Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#39	For new programs, has a broodstock collection plan been developed?					
	Is the broodstock collection plan written?					
	For a non-captive broodstock program:					
	Was an unbiased, representative sample collected?					
	Was the recommended number of broodstock collected?					
	For a captive broodstock program:					
	Were captive brood progeny excluded as donors for propagating the next					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
		4				Existing Program; does not apply	
		4				Existing Program; does not apply	
		4				Existing Program; does not apply	
		4				Existing Program; does not apply	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
#40	For a new program, was the donor selection outline followed in selecting the hatchery broodstock? Is a donor selection plan written? Was the donor selection outline followed in the selecting the broodstock? Was the target stock recommended in the donor selection process actually used?						
		4				Existing Program; does not apply	
		4				Existing Program; does not apply	
		4				Existing Program; does not apply	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#41	For existing programs, were the broodstock collection procedures followed?					
	Is the broodstock collection plan written?					
	Does the broodstock collection plan follow the guideline:					
	Was an unbiased, representative sample collected?					
	Was the recommended number of broodstock collected?					
	Were the broodstock collection procedures in hatchery operation plan understood and followed?					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
					4	None provided to inspection team	Develop procedures for IHOT Operational Plan
			4		4	Weir is placed too high on the river to collect representative sample	Relocate adult collection weir lower on river to collect representative sample of adults
						Discussion	
						Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#42	Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?					
	Are the spawning protocols written?					
	Are daily or weekly spawning logs available?					
	Were the appropriate number of spawners used?					
	Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?					
	Was the sex-ratio within the limits given in the performance standards?					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
			4			Review of hatchery documents	Include in IHOT O.P.
			4			Review of records/Discussion	
			4			Review of records/Discussion	
			4			Review of records/Discussion	
			4			Review of records/Discussion	

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No	
#43	<p>Is there a genetics monitoring and evaluation program in place?</p> <p>Is a genetics monitoring and evaluation program available?</p> <p>Does the plan address the following elements listed in IHOT:</p> <p>Does the program have elements needed to meet evaluation goals 1-4?</p> <p>Has a qualified geneticist reviewed and endorsed the program (goal 5)?</p> <p>Will the program collect the data and maintain the records needed to evaluate</p>					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

		N/A	Yes	?	No		
					4	None provided to inspection team; collection of baseline samples is being done	Develop plan for IHOT Operational Plan
		4					
		4					
		4					

Table 1 Lyons Ferry Hatchery Compliance (Spring Chinook) With Performance Measures

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control to those that require a change in agency policy or procedures to those that have a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or PM not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but not clearly definable at this time

Remedial Actions at Lyons Ferry Hatchery (Spring Chinook)

This section presents the corrective actions required to bring the Lyons Ferry Hatchery Spring Chinook program into compliance with the IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 2).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ($\pm 40\%$).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 2. Remedial Actions Required at Lyons Ferry Hatchery (Spring Chinook)

Remedial Action Required	Cost	PMs ¹
Type 1 - Non-compliance issues resulting from items beyond human control or PM		
not relevant for this hatchery		
Pre-spawning mortality greater than criteria (No longer a problem because fish are not held at Tucannon Hatchery)	----	4b
Need better adult returns	----	4c,4g, 4h, 22a4,36
No telephone pagers in use (Not a problem because two people always on station, have alarms on station)	----	6
Hauling temperatures higher than criteria	----	23

Remedial Action Required	Cost	PMs ¹
Type 2 - Remedial actions requiring changes in agency policies or procedures		
<ul style="list-style-type: none"> Develop goal for green-eye to eyed-egg and eyed-egg to fry survival for IHOT 	----	4d, 4e
Regional quality control officer to oversee production procedures and monitor feed quality	----	12
Include specific incubation standards in IHOT Operations Plan	----	18
Include specific rearing standards in IHOT Operations Plan	----	19
Density greater than criteria; need to consider reducing density or changing procedures	----	19, 21, 30
Measure percent smoltification	----	22a1
Uncertain if release strategy is appropriate for the program	----	22c
Conflict between WDFW and IHOT disinfection policies	----	23
Reduction of DO to 8 ppm after transport system is functioning properly	----	23
Develop broodstock collection plan for IHOT Operations Plan	----	41

Remedial Action Required	Cost	PMs ¹
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor total gas pressure and dissolved oxygen (instruments only)	\$4,000	5b,21, 29
Monitor chemistry parameters on routine basis	\$200/year	5c,29
Monitor contaminants on routine basis	\$400/year	5g
Type 4 - Remedial actions requiring significant capital expenditures		
Chiller for incubation 100 ton chiller (shipping, installation, and taxes)	\$200,000	5a, 22a5,36
Need double screen for 14 raceways on salmon side of hatchery (30sf @\$50/sf + \$500 labor = \$2,000/raceway)	\$28,000	10
Type 5 - Remedial actions that may require significant capital expenditures but not clearly definable at this time		
Relocate adult collection weir lower on river to collect representative sample of adults	—	35,41

Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries

This section presents the audit findings for the Lyons Ferry Hatchery's Spring Chinook contribution of adult fish to fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2, 3, 4, 5, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4-5 years after the fish have been released from the hatchery.

**Table 3. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries -
Lyons Ferry Hatchery (Spring Chinook)**

Year	Fisheries	Spawning Grounds³	Hatchery³	Smolt to Adult Survival (percent)

Data obtained from Missing Production Groups Annual Reports or from the Regional Mark Information System database.

	(Broodyear)	(Broodyear)	(Broodyear)	
1981				
1982				
1983				
1984				
1985				
1986	15	22	298	0.22
1987	2	161	72	0.15
1988	25	395	91	0.35
1989	11	193	56	0.26
1990				
1991				
1992				

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the Federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program were estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 4 shows the annual operating expenses for the Lyons Ferry Hatchery (Spring Chinook).

Table 4. Annual Operating Expenses - Lyons Ferry Hatchery (Spring Chinook)

Component	1994	1995	1996
Personnel Costs			
Operational Costs ⁴			
Capital Costs ⁴			
Indirect Costs ⁴			

The levels of detail for expense information was expanded after the Phase 1 data collection process was completed. This table will be updated at the completion of Phase 2.

Lumped Hatchery Costs	\$1,970,244	\$1,761,325	\$2,194,283
Lumped Third Party Costs			
Total Hatchery Costs	\$1,970,244	\$1,761,325	\$2,194,283
Source of Funds			
COE	100%	100%	100%
Program Production (lb)	5,958	9,559	
Total Production (lb)	437,793	373,756	
Program as Percent of Total	1.4%	2.6%	2.6
Program Costs	\$26,813	\$45,047	\$57,051

PMs are Performance Measures that were extracted from the IHOT 1995 report. The IHOT Performance Measures are listed in Table 1 in Section 3 in numerical order.

When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Does not include unspent capital budget for 1994 and 1995; includes costs for Lyons Ferry Hatchery, Tucannon Hatchery, and the satellite facilities.

Assumed value based on expenditure for last year.